

Only one chance to get it right

Lighting for live events

Application Note

When you need to know as much about the electrical system as possible

As a 41-year veteran of live event lighting, stage electrician David Hatch has designed and produced lighting plans for hundreds of productions, ranging from corporate meetings to professional musical theater and opera performances. Because live events present only one chance to get it right,

he needs to know as much about the electrical system as possible, before and during the show. Typically that has involved moving digital multimeters (DMMs) from point to point, which is time consuming and doesn't provide simultaneous information on current and voltage.

When Hatch became aware of the new Fluke CNX™ 3000 wireless system that allows technicians to monitor up to three different measurements at once on a wireless DMM or up to 10 measurements simultaneously with a PC adapter, he decided to test out the CNX 3000 Industrial System in real life applications.

The first step was to use the CNX 3000 system to monitor voltage and current on a backup generator for a show that required 24-hour power. In that situation, the generator had to be monitored 24 hours a day. The operator hooked up the CNX i3000 current modules to the three legs of the three-phase 208 V/120 V output on the generator and the CNX v3000 AC voltage module across legs one and two on the generator, and then retired to his truck about 10 or 12 feet away to view the results on the wireless DMM. "This was especially helpful for the overnight operator because he could stay on top of what was going on and be out of the cold wind and fog," says Hatch.

Next, Hatch tested the wireless system on one of his most important applications—determining dynamic mixed load values on a 400 A 208 V/120 V three-phase panel—during a live show. As a show runs, lighting loads change constantly based on what's happening on stage. Those changing lighting loads cause unbalanced loads and the combination of resistive and inductive loads create triplen harmonics on the neutral.



Triplen harmonics are odd multiples of the third harmonic and can lead to very large currents circulating in the neutral and the transformer, which in turn causes significant heating.

For the live show Hatch attached the three current modules to the primary of the 225 kVA 480 V to 208 V transformer and then moved them to the secondary side to check the neutral for triplen harmonics. The CNX v3000 Wireless Voltage Module and the CNX 3000 Wireless Multimeter were moved to measure voltage between the three phases. The results were viewed over the course of the five-day show on a laptop by way of the PC adapter. The loads turned out to be as expected based on the calculations made during the layout process. There were just minor changes due to the actual voltage supplied and the length of the cable on the branch circuits.

The advantages that Hatch sees with using the Fluke CNX 3000 wireless system include:

- Easy remote tracking
- Saved time. Increased safety
- Three-phase load studies

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